1 **ABSTRACT**

2 When asked questions that are framed by moral action rather than by moral judgment, dual-

3 process moral theory posits that people will tend to be more deontological or more sensitive to

4 norms because of a stronger moral-disgust arousal to a sacrifice proposal (e.g., sacrifice one

5 innocent life to save five or more others). However, the action-based model of cognitive

6 dissonance predicts that the decision-maker will be less deontological or less sensitive to norms

7 because of the stronger motivation process to reduce the dissonance state. A traditional moral

8 dilemma paradigm (Study 1) was applied and the results supported the prediction of action-

9 based model of cognitive dissonance. To further probe which of norm sensitivity, consequence

10 sensitivity and generalized action/inaction preference matters in moral question-framing effect,

11 a 2 (norm: proscriptive/prescriptive) × 2 (consequence: benefits greater than/smaller than costs)

12 × 2 (frame: moral judgment/moral action) within-subject design with Consequences-

13 generalized Action/inaction-Norms sensitivity (CAN) algorithm (Study 2) and a

14 Consequences–Norms–generalized Inaction/action preferences (CNI) model design (Study 3)

15 were comprehensively applied. Together, the results show that participants were less sensitive

16 to norms, were more sensitive to consequences, and transitioned from a generalized action

17 preference to a generalized inaction preference when they were asked moral action- versus

18 moral judgment-framed questions. Thus, the present research supports the explanations of

19 action-based model of cognitive dissonance and reveals that moral decision-making is affected

20 by the motivation process. Theoretical and methodological implications are also discussed.

21 ***Keywords*:** question-framing effect; moral decision-making; dual-process morality theory;

22 action-based model of cognitive dissonance; CNI model; dilemma

23   The Motivation Process of the Moral-question Framing Effect is Explained by the Action-

24   based Model of Cognitive Dissonance

25   **INTRODUCTION**

26   An often-discussed moral dilemma involves people having to decide whether they

27   would sacrifice one innocent person to save five or more others. If they approve of the sacrifice

28   proposal, they obey the utilitarian principle claiming on greatest benefits while disobey the

29   deontological principle of not killing any innocent person. If they disapprove of the sacrifice

30   proposal, they obey deontological principle while disobey utilitarian principle. Confronting

31   this dilemma situation, two types of question are typically asked, namely "Is it morally

32   acceptable to perform the described action (e.g. sacrificing one innocent to save five others)?"

33   and "Would you perform the described action?". The answers to these two questions may be

34   different as the former focuses on the moral acceptance of the proposed behavior whereas the

35   latter focuses on the implementation of the moral proposal. This phenomenon is known as the

36   "moral-question framing effect". The discrepancies between judgment and action choices in

37   moral decision-making were identified by many researchers (Baron, 1992; Gawronski,

38   Armstrong, Conway, Friesdorf, & Hutter, 2017; Patil, Cogoni, Zangrando, Chittaro, & Silani,

39   2014; Tassy, Oullier, Mancini, & Wicker, 2013).

40   The moral-question framing effect is very particular among the framing effects in

41   moral decision-making domain. Previous found framing effects in moral decision-making

42   mainly addressed that moral decisions can be affected by the descriptive language frames of

43   the scenarios (Bohm & Theelen, 2016; Broeders, van den Bos, Muller, & Ham, 2011; Cao et

44   al., 2017; de Heus, Hoogervorst, & Dijk, 2010; Demaree-Cotton, 2014; Diederich & Trueblood,

45   2018; Evans & van Beest, 2017; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Guo,

46   Trueblood, & Diederich, 2017; Ledgerwood & Boydstun, 2014; Macoveanu, Ramsoy, Skov,

47   Siebner, & Fosgaard, 2016; Pastotter, Gleixner, Neuhauser, & Bauml, 2013; Wagemans, Brandt,

48   & Zeelenberg, 2018). The "trolley problem" can be used as an example: although the moral

49   nature of the proposal is the sacrifice of an innocent person and the moral consequence is saving

50   five people, moral acceptance has been found to be lower when the behavior proposal is framed

51   as pushing the innocent person from a bridge than when framed as pressing a button to switch

52   the trolley pathway (Greene et al., 2001). Greene postulated that this is because "pushing" has

53   a more personal connotation than "pressing" and further evokes additional moral disgust in

54   relation to the sacrifice, whereas "pressing" induces a more rational consideration of the result

55   of the proposed behavior than "pushing"; consequently, "pressing" was accepted more often

56   than was "pushing." However, differently in moral question-framing effect, both the scenario

57   and the behavior proposal are consistent across the two types of questions. The only difference

58   is the question formulation which emphasizes on behavior acceptance or behavior execution.

59   **Two Potential Explanations for Moral Question-Framing Effect**

60   The first potential explanation can be driven from dual-process morality theory

61   through which emotion arousal is related to deontological decisions while rational reasoning

62   corresponds to utilitarian decisions; this theory was verified in several previous studies (Greene,

63   2007, 2009; Greene et al., 2009; Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008). In

64   the literatures, many framing-effects have been explained by the dual-process morality theory,

65   such as how the goal frames of "kill" or "save" (Broeders et al., 2011; Petrinovich & O'Neill,

66   1996), the action frames of "push" or "don't push" (Pastotter et al., 2013), and the consequence

67   frames of "gain" or "loss" (Bohm & Theelen, 2016; Cao et al., 2017; De Dreu & McCusker,

68   1997; de Heus et al., 2010; Evans & van Beest, 2017) affect moral decisions. Among these

69   framing effects, different frames activate different propensies of cognition and emotion.

70   Individuals tend to be utilitarian when strengthening a rational cognitive propensity but

71   deontological when enhancing emotional arousal, especially feelings of moral disgust

72   (Cushman, Young, & Greene, 2010; Greene, 2007; Greene et al., 2008; Greene & Paxton, 2009;

73   Rand, Greene, & Nowak, 2012). Previous research has shown that individuals exhibit more

74   emotions in relation to moral action implementation than moral proposal acceptance (Pletti,

75   Lotto, Buodo, & Sarlo, 2017). This suggests that, based on dual-process morality theory, when

76   a question is framed by the moral action rather than by the moral judgment, individuals should

77   be more averse to sacrifice and tend to refuse sacrifice proposal, signifying that they would be

78   more sensitive to moral norms accounted by deontological principle.

79   However, the results of Gawronski. et al (2017) indicate partly opposite conclusion;

80   namely, individuals become less sensitive to moral norms and prefer more generalized refusal

81   to the sacrifice proposal under the moral action frame than under the moral judgment frame.

82   The discrepancy of generalized preference under moral action frame and moral judgment frame

83   can be explained by dual process morality theory. As more sacrifice disgust emotion is activated

84   under moral action frame than under moral judgment frame (Pletti, Lotto, Buodo, & Sarlo,

85   2017), individuals under moral action frame became overall more likely to refuse the sacrifice

86   proposal. However, the discrepancy of sensitivity to moral norms can not be explained by dual

87   process morality which implies more sensitive to moral norms under moral action frame than

88   under moral judgment frame, while the results turn opposite. Therefore, there should be

89   alternative explanations for moral question-framing effect.

90   Based on the analysis of the dilemma situations, action-based model of cognitive

91   dissonance (Harmon-Jones & Harmon-Jones, 2002; Harmon-Jones, Harmon-Jones, & Levy,

92   2015; Harmon-Jones, Amodio, & Harmon-Jones, 2009) might be the potential alternative

93   explanation for moral question-framing effect. Confronting the dilemma, individuals may be

94   observed to endure a potential moral violation regardless of the decisions they make, especially

95   in cases in which dilemmas comprise proscriptive norms and consequences of benefits greater

96   than costs. Potential violations of moral principles (no matter utilitarianism or deontology)

97   threaten individual's positive moral self image and this mental conflict results in an ethical

98   dissonance state (Barkan, Ayal, & Ariely, 2015), motivating the affected individual to reduce

99   such dissonance when making decisions. According to action-based model of dissonance,

100   cognitive incongruence can induce not only cognitive dissonance but also dissonance reduction.

101   The action-based model then suggests that the negative affective state of dissonance is aroused

102   not by all cognitive conflict but specifically when cognitions with action implications conflict

103   with one another, making it difficult to act (Harmon-Jones et al., 2015). Regarding traditional

104   moral-dilemma decisions, individuals may consider that the sacrifice proposal potentially

105   violates norms of not killing but that the consequence is considerably beneficial, or vice versa.

106   Thus, it is difficult to decide whether or not conduct the proposed behavior. Aiming to reduce

107   the dissonance state, individuals in the action frame condition will demonstrate more diffusion

108   of alternatives than will individuals in judgment frame condition. Specifically, they will

109   consider the alternative choices and extend these to rationalize other options (Harmon-Jones &

110   Harmon-Jones, 2002; Harmon-Jones et al., 2009; Proulx, Inzlicht, & Harmon-Jones, 2012).

111   Consequently, although individuals are overall aversive to the sacrifice proposal and refuse it,

112   they would be motivated to consider the alternative choices and more tend to approve the

113   sacrifice proposal under action frame than under judgment frame.

114   Take the traditional trolley problem as an example. The uncontrollable trolley car is

115   rushing along the track with the brake out of work. Five workers are stuck in the track just in

116   front of the trolley car, and they would be killed if the trolley car keeps moving. You can press

117   a button to turn the trolley car to the sidetrack and run over only one worker. If you press, the

118   one worker would die and the five workers would be saved. Two types of questions would be

119   asked, "Is it morally acceptable to perform the described action?" [i.e., moral judgment] or

120   "Would you perform the described action?" [i.e., moral action]. In the logic of dual process

121   morality, action framing-question induces more emotional disgust to sacrifice innocent than

122   judgment framing-question, as a result, individuals in action framing-question condition will

123   tend to refuse pressing the button ***MORE*** than whom in judgment framing-question condition.

124   However, in the view of action-based model of cognitive dissonance, the action framing-

125   question motivates individuals to reduce the cognitive dissonance state induced by the mental

126   conflict of the situation while the judgment framing-question will not motivate the dissonance

127   reduction. Therefore, individuals in action framing condition would consider that press the

128   button is a beneficial alternative although overall, they refuse to do that. Accordingly,

129   individuals in action framing-question condition will tend to refuse pressing the button ***LESS***

130   than whom in judgment framing-question condition. Study 1 will test the contradictory

131   predictions by the two potential explanations with traditional moral dilemma paradigm.

132   **Resolving Interpretational Ambiguities**

133   The interpretational ambiguities of traditional moral dilemma paradigm have been

134   addressed a lot in recent literatures (Gawronski, et al., 2017; Gawronski, & Beer, 2017).

135   Generally, the binary classification of utilitarianism and deontology is ambiguous. Such as the

136   trolley problem, pressing the button represents utilitarian response focusing on the greater

137   benefits than costs while not pressing the button represents deontological response focusing on

138   the moral norms underlying the behavior. However, when individuals tend more likely to press

139   the button, it has three potential possibilities. The first is that the individuals have a weaker

140   norm sensitivity and are less aversive to the sacrifice proposal. The second is that the

141   individuals have a stronger consequence sensitivity and found the results of the proposed

142   behavior is considerably beneficial. The third is that the individuals just want to approve the

143   proposal irrespective of the norms and consequences behind. The traditional dilemma paradigm

144   can not dissociate the three possibilities. Thus, we can not tell which of norm sensitivity,

145   consequence sensitivity and generalized action preference matters in the moral question-

146   framing effect under traditional dilemma paradigm.

147   To address the manipulation limitation of traditional dilemma, considering that

148   "utilitarian" presuppose that the observed behavior is sensitive to consequences, which requires

149   experimental manipulations of consequences and that "deontological" presuppose that the

150   observed behavior is sensitive to moral norms, which requires experimental manipulations of

151   moral norms, four types of dilemmas involving different consequences and norms

152   combinations should be considered (Gawronski, et al., 2017; Gawronski, & Beer, 2017): (a)

153   dilemmas in which a proscriptive norm opposes the proposed behavior and the benefits of

154   behavior for overall well-being are greater than the costs of behavior; (b) dilemmas in which a

155   proscriptive norm opposes the proposed behavior and the benefits of behavior for overall well-

156   being are smaller than the costs of behavior; (c) dilemmas in which a prescriptive norm

157   endorses the proposed behavior and the benefits of behavior for overall well-being are greater

158   than the costs of behavior; (d) dilemmas in which a prescriptive norm endorses the proposed

159   behavior and the benefits of behavior for overall well-being are smaller than the costs of

160   behavior. These four types of dilemmas actually constitute a 2 (norm: proscriptive/prescriptive)

161   × 2 (consequence: benefits greater than/smaller than costs) within-subject design. Therefore,

162   we can run a within-subject ANOVA to detect whether exist significant main effects of norm

163   and consequence and their interaction. Moreover, based on the above 2 × 2 design, a new

164   algorithm could be used to export three estimates relatively representing norm sensitivity,

165   consequence sensitivity and a generalized action/inaction preference, named CAN algorithm

166   (Liu, & Liao, in review):

167   *Consequence sensitivity index* (*C parameter*) = (p(approval ratio | proscriptive norm, benefits >

168   costs) + p(approval ratio | prescriptive norm, benefits > costs) − p(approval ratio | proscriptive

169   norm, benefits < costs) − p(approval ratio | prescriptive norm, benefits < costs))/2;

170   *Norm sensitivity index* (*N parameter*) = (*p*(approval ratio | prescriptive norm, benefits > costs)

171   + *p*(approval ratio | prescriptive norm, benefits < costs) − *p*(approval ratio | proscriptive norm,

172   benefits > costs) − *p*(approval ratio | proscriptive norm, benefits < costs))/2;

173   *Generalized Action/inaction preference* (*A parameter*) = (*p*(approval ratio | proscriptive norm,

174   benefits > costs) + *p*(approval ratio | proscriptive norm, benefits < costs) + *p*(approval ratio |

175   prescriptive norm, benefits > costs) + *p*(approval ratio | prescriptive norm, benefits < costs))/4.

176   If C/N parameter is greater (less) than zero, then the participants are identified as being

177   sensitive to supporting (opposing) the norm/consequence. The bigger the C/N parameter, the

178   more sensitive they are to supporting the norm/consequence. If A parameter is greater (less)

179   than 0.5, then the participants are identified as having a generalized action (inaction) preference.

180   The bigger the A parameter, the more generalized the approval of the sacrifice proposal. If C/N

181   parameter is not significantly different with zero, the the participants are identified as not

182   sensitive to norm/consequence. If the A parameter is not significantly different with zero while

183   at least one of C/N parameters are significant, the participants are identified as having a pure

184   morality attitude of either utilitarian or deontological; if the A parameter is not significantly

185   different with zero while neither C nor N parameters are significant, the participants are

186   identified as randomly answering. The CAN algorithm is very pervasive in literature, such as

187   Talhelm et al. (2014) computed loyalty/nepotism as the amount participants rewarded their

188   friend minus the amount they punished their friend. Considering that the new algorithm we

189   developed can measure the Consequence sensitivity, Norm sensitivity and generalized

190   Action/inaction preference, and for differentiating our algorithm with the following introduced

191 Consequences–Norms–generalized Inaction/action preferences (CNI) model, we name the new

192 algorithm as CAN algorithm for short (Liu, & Liao, in review).

193 Actually, the CNI model developed by Gawronski et al. (2017) could also export three

194 similar indexes to CAN algorithm. The CNI model has the same 2 (norm:

195 proscriptive/prescriptive) × 2 (consequence: benefits greater than/smaller than costs) within-

196 subject design and the parameter estimations were based on multinomial processing tree

197 approach which is widely used in social psychology (Hutter, & Klauer, 2016). It applied

198 maximum likelihood statistics to export three estimates representing sensitivities to norms and

199 consequences, and a generalized inaction/action preference irrespective of norms and

200 consequences, the multinomial processing tree and the probability equations of CNI model was

201 shown in Fig. 1. CNI model has been applied a lot in recent morality studies to clarify previous

202 ambiguities under traditional dilemma paradigm (Białek, Paruzel-Czachura, & Gawronski,

203 2019; Gawronski et al., 2017; Gawronski, Conway, Armstrong, Friesdorf, & Hütter, 2018;

204 Hennig, & Hütter, 2019; Zhang, Kong, Li, Zhao, & Gao, 2018). The specific manipulation of

205 CNI model can refer to Gawronski et al. (2017).

206 <insert Fig. 1 near here>

207 Five differences between CAN algorithm and CNI model need to be addressed (Liu,

208 & Liao, in review): (a) CNI model hypothesizes a sequential processing of moral dilemma

209 decision-making while CAN algorithm does not. In CNI model's multinomial processing tree

210 approach, consequences are firstly considered, then norms, then general action/inaction

211 preference irrespective of consequences and norms. This sequential processing might be true;

212 however, the decision-makers could also consider norms first, consequences second and

213 general action/inaction preference at last. Gawronski et al. (2017) also discussed this possibility

214 in the footnote seven of their article and found the results would be a little different if the

215 positions of C and N were reversed. Therefore, we avoided the priori hypothesis of sequential

216 processing and applied a common subtracting strategy of parameter estimation. (b) CNI model

217 exports the parameters in a group estimation level, thus it can not be used in a

218 correlation/regression design and the parameters can only be compared across two groups or

219 to a specific value. However, CAN algorithm exports the parameters in an individual estimation

220 level and overcomes these limitations. (c) The statistical interpreting direction and meaning

221 between I parameter in CNI model and A parameter in CAN algorithm is inverse. The bigger

222 value of I parameter in CNI model represents a stronger general Inaction preference while the

223 bigger value of A parameter in CAN algorithm represents a stronger general Action preference.

224 (d) The I parameter in CNI model is dissociated from norms/consequences sensitivities. It

225 represents the group's generalized preference on the condition of being not driven by norms or

226 consequences. However, the A parameter in CAN algorithm is not dissociated from

227 norms/consequences sensitivities. It represents the individual's generalized preference

228 including all the influencing factors' effects. (e) CNI model depends on binary response pattern,

229 the measurement should be designed as Yes/No. Differently, CAN algorithm does not have this

230 limit, it can be used in the continuous design. Therefore, both CNI model and CAN algorithm

231 could be applied in the study and validate for each other.

232   We used CAN algorithm in Study 2 to preliminarily probe which of Consequence

233   sensitivity, Norm sensitivity and generalized Action/inaction preference matters in the moral

234   question-framing effect, and we replicated with CNI model in Study 3 to validate the results of

235   CAN algorithm. Before CNI model and CAN algorithm, a process dissociation (PD) approach

236   was developed to dissociate utilitarian and deontological preference extent (Conway, &

237   Gawronski, 2013). The PD approach only considered the two situations of proscriptive norms

238   with benefits greater/smaller than costs, and these two situations were included in CAN

239   algorithm and CNI model. Thus, we also run the PD analysis in the studies 2 and 3.

240   **Overview of Studies**

241   Study 1 employed a traditional moral-dilemma paradigm to assess whether

242   participants would have more acceptance for the sacrificial proposal under the moral action

243   frame compared with the moral judgment frame. To further clarify which of Consequence

244   sensitivity, Norm sensitivity and generalized Action/inaction preference matters in the moral

245   question-framing effect, Study 2 applied a 2 (norm: prescriptive/proscriptive) × 2 (consequence:

246   benefits greater than/smaller than costs) × 2 (frame: moral judgment/moral action) within-

247   subject design and together with the CAN algorithm. Meanwhile, the robustness of Study 1

248   was tested, and the process-dissociation method developed by Conway and Gawronski (2013)

249   was also used to calculate the U factor (Utilitarian; represents the sensitivity to consequences)

250   and D factor (Deontological; represents the sensitivity to norms) for deeper insight. To further

251   validate the results of Study 2, we conducted Study 3 with CNI model (Gawronski et al., 2017).

252   The "C" (sensitivity to consequences), "N" (sensitivity to norms), and "I" (generalized

253   inaction/action preferences) parameters were exported and compared across the moral action

254   and moral judgment frames. The robustness of the results of Studies 1 and 2 were also assessed.

255   The materials of Study 1 were inserted into public class quiz. Except for our measures,

256   the rest of the items were related to the public class content; they were not related theoretically

257   to our study. No participants were excluded in Study 1. Thus, we already reported all the

258   measures and manipulations in Study 1. Regarding Studies 2 and 3, all the measures,

259   manipulations, and participant exclusions have already been reported.

260   **STUDY 1**

261   **Method**

262   *Participants*

263   In total, 578 university students participated in this study (291 females; aged 18 to 23,

264   $M = 20.51$, $SD = 1.66$) and achieved course credits as compensation. We calculated the sample

265   size with G*Power software. Because the effect sizes for similar studies by Gawronski et al.

266   (2017) were 0.268 and 0.363, the minimum effect size was set as 0.2, with an α of 0.05 and a

267   statistical power of 0.95. The minimum total sample size was 327. To obtain a more stable

268   effect size, we collected as many participants as possible from public classes in the university

269   during the Spring semester of 2017. The results were not checked before terminating the data

270   collection. The sensitivity power analysis (G*Power; Faul, Erdfelder, Lang, & Buchner, 2007)

271   determined that effect sizes of $d = 0.12$ ($N = 578$) could be detected with standard criteria (i.e.,

272   $α = 0.05$ two-tailed, $1 - β = 0.80$, difference between two dependent means of matched pairs).

273   *Design*

274   A within-subjects design with respect to the moral question frames was applied.

275 Participants answered the following two questions after reading each moral dilemma and the

276 corresponding moral sacrifice proposal: "Is it morally acceptable to perform the described

277 action?" (i.e., the moral judgment frame) and "Would you perform the described action?" (i.e.,

278 the moral action frame). Participants answered the questions according to a nine-point scale in

279 which a rating of 1 represented "*definitely not*" and 9 represented "*definitely yes*." If the rating

280 was greater (less) than the median rating of 5, the participants were identified to be utilitarian

281 (deontological), and the higher the rating, the more utilitarian or less deontological they were

282 coded as being.

283   *Materials and procedure*

284   Six moral-dilemma scenarios were selected from Koenigs et al. (2007), each of which

285 were similar in terms of emotional arousal, length (see Appendix 1 for detail). All the scenarios

286 have significant moral relevance to the study population in a pre-study, and the participants in

287 pre-studies were excluded from the formal studies (for detail, please refer to the Supplemental

288 Materials). A proposed moral sacrifice was presented after each dilemma, such as "smother

289 your child in order to save yourself and the other townspeople." Participants answered the

290 moral judgment and moral action framing questions in sequence. The questionnaire was

291 embedded in a quiz during a public class and completed in paper-and-pencil format.

292 **Results**

293   As shown in Fig. 2, a one-sample *t* test was conducted with a median of 5 as the test

294 value. The moral rating under the moral judgment frame was found to be significantly lower

295   than the median of 5 (M = 3.35, SD = 1.67, t(577) = −23.68, p < .001, Cohen's d = − 0.985, 95%

296   confidence interval (CI) of the difference [−1.78, −1.51]), as was that under the moral action

297   frame (M = 3.96, SD = 1.65, t(577) = −15.20, p < .001, Cohen's d = − 0.632, 95% CI of the

298   difference [−1.18, −0.91]). This result suggests that participants were, overall, deontological in

299   their moral decision-making.

300   <Insert Fig. 2 near here>

301   A paired-sample t test showed that the moral rating under the moral action frame was

302   significantly higher than that under the moral judgment frame (t(577) = 10.58, p < .001,

303   Cohen's d = 0.62, 95% CI of the difference [0.49, 0.72]). This means that although participants

304   were deontological overall, they became less deontological or more biased toward

305   utilitarianism under the moral action frame than under the moral judgment frame.

306   **Discussion**

307   The results of Study 1 support the prediction of action-based model of dissonance;

308   participants were less deontological under the moral action frame compared with the moral

309   judgment frame. When facing a moral dilemma, individuals endured potential moral violations

310   regardless of the decisions they made. This induced a subjective feeling of dissonance and

311   motivated individuals to reduce this state of dissonance. When considering moral action,

312   participants had greater motivations toward reducing dissonance and tended to consider the

313   reasonableness of conducting the moral proposal. This is the same mechanism as spreading the

314   alternatives (Harmon-Jones et al., 2009; Harmon-Jones et al., 2015). Consequently, the moral

315   action frame induced less deontological propensity than the moral judgment frame. The dual-

316   process model of morality cannot explain this deontological reduction phenomenon.

317   Participants became less (but not more) deontological under the moral action frame than under

318   the moral judgment frame, although previous research revealed that the moral action frame

319   evoked more emotional involvement than did the moral judgment frame (Gawronski et al.,

320   2017; Pletti et al., 2017).

321   However, the traditional moral-dilemma paradigm contradicts utilitarianism (or a

322   sensitivity to consequences) and deontology (or a sensitivity to norms), which leads to

323   uncertain outcomes and inferences. Regarding the results of Study 1, the increase in moral

324   acceptance under the moral action frame relative to the moral judgment frame could be

325   explained as either a deontological reduction or a utilitarian enhancement. This ambiguity may

326   be partly due to the conceptual manipulation. In the case of the traditional moral dilemma, only

327   one combined situation (proscriptive norm and benefits greater than costs) was considered and

328   not the other three combined situations (proscriptive norm and benefits smaller than costs;

329   prescriptive norm and benefits greater than costs; prescriptive norm and benefits smaller than

330   costs). Therefore, Study 2 utilized a 2 (norms: prescriptive/proscriptive) × 2 (consequences:

331   benefits greater than/smaller than costs) × 2 (frame: moral judgment/moral action) within-

332   subject design and exported C, A, N parameters based on CAN algorithm. Furthermore, the

333   robustness of Study 1 was tested, and process dissociation was used to calculate the U and D

334   factors to obtain deeper insights.

335   **STUDY 2**

336   **Method**

337   *Participants*

338   In this study, 177 university students (59 females; ages 18–23, $M = 20.23$, $SD = 1.13$)

339   were recruited and were compensated with course credits. The participants were clearly

340   informed about and provided their consent to participate in the study. The sample size was

341   determined according to Gawronski et al. (2017); specifically, we tried to keep the same sample

342   size as that of their Study 3a/3b. They recruited 200 participants to detect a small between-

343   group effect of $d = 0.40$ with a statistical power of 0.80 and an α of 0.05. Because we used a

344   within-subject design, we recruited slightly fewer participants than they did based on our actual

345   recruiting situation. The results were not checked before terminating data collection. Thirteen

346   participants did not pass the attitude check, and they were excluded from further analysis. The

347   sensitivity power analysis (G*Power; Faul et al., 2007) determined that effect sizes of $d = 0.21$

348   ($N = 177$) could be detected with standard criteria (i.e., $α = 0.05$ two-tailed, $1\text{-}β = 0.80$,

349   difference between two dependent means of matched pairs).

350   *Design*

351   A 2 (norm: prescriptive/proscriptive) × 2 (consequence: benefits greater than/smaller

352   than costs) × 2 (frame: moral judgment/moral action) within-subject design was used, with

353   each dilemma having four versions as shown in Appendix 2. Participants answered the same

354   moral judgment and moral action questions as those in Study 1. To prevent participants from

355   choosing the median score of 5, indicating no definite decision regarding the moral proposal,

356   a 10-point scale was used to replace the 9-point scale, with a rating of 0 representing "*definitely*

357   *not*" and 9 representing "*definitely yes*." If the rating was greater (less) than the average of 4.5,

358   then the participants were identified as being utilitarian (deontological), and the higher the

359   rating, the more utilitarian or less deontological they were coded as being.

360   *Materials and procedure*

361   Three dilemmas were used: one was sourced directly from Gawronski et al. (2017),

362   and the other two were developed based on the scenario structures used in Gawronski et al.

363   (2017), as shown in Appendix 2. Each dilemma had four versions, resulting in 12 scenario

364   sessions. Prior to the study initiation, the dilemmas were tested and found to be significantly

365   correlated with inherent morality (see supplemental materials). The attitude-checking scenario

366   from Gawronski et al. (2017) was also included in our Study 2. Participants read 13 sessions

367   of scenarios and answered the questions accordingly.

368   On arrival, participants were advised that "This is a story reading and comprehension

369   task for filtering materials for the following experiments. Some stories seem very similar but

370   are different in important ways. After reading each scenario, you will be asked several questions

371   about the scenarios. Please carefully read and understand the scenarios, and answer the

372   questions that follow." The participants then signed the informed-consent form and went to a

373   separate cubicle to conduct the experiment.

374   The dilemma scenarios were presented randomly using Inquisit 3.0. Following each

375   dilemma, moral judgment and moral action framing questions were presented. Before the

376   formal experiment was undertaken, a practice scenario was presented to ensure that the

377   participant understood how to complete the experiment. The practice scenario was not included

378   in the formal experiment.

379   **Results**

380   The results of Study 1 were well replicated. For detail, please refer to the supplemental

381   materials. Following we presented the results of process dissociation and ANOVA with CAN

382   algorithm analyses.

383   *Analysis 1: Process dissociation*

384   The process dissociation approach was developed based on binary moral judgments,

385   using the probabilities of action/inaction responses with respect to moral dilemmas with

386   proscriptive norms involving benefits of an action that were either greater than the costs of the

387   action (i.e., incongruent dilemmas) or smaller than the costs of the action (i.e., congruent

388   dilemmas) (Conway & Gawronski, 2013; Gawronski et al., 2017). The present study used

389   continuous rating scales, so we first transformed the participants' ratings into ratio data with

390   the original moral acceptance scores divided by 9. The U and D factor scores were then

391   calculated using the procedures described by Conway and Gawronski (2013):

392   U = p(approval ratio | proscriptive norm, benefits > costs) − p(approval ratio |

393   proscriptive norm, benefits < costs);

394   D = 1 − [p(approval ratio | proscriptive norm, benefits < costs) / (1 − U)].

395   The results were shown in Fig. 3.

396   <Insert Fig. 3 near here>

397   We conducted a 2 (frames: moral judgment/moral action) × 2 (moral factors: U/D)

398 within-subject analysis of variance (ANOVA). The moral factor scores under the moral action

399 frame were significantly higher than those under the moral judgment frame ($F(1, 163) = 12.68$,

400 $p < .001$, $\eta_p^2 = 0.072$); the moral factor scores for the D factor were significantly higher than

401 those for the U factor ($F(1, 163) = 1633.68$, $p < .001$, $\eta_p^2 = 0.91$). The interaction between the

402 frames and moral factors was significant ($F(1, 163) = 4.56$, $p = .034$, $\eta_p^2 = 0.027$). Further

403 simple effect analysis demonstrated that the differences between frames was significant for the

404 U factor ($F(1, 163) = 10.87$, $p = .001$, $\eta_p^2 = 0.063$) but not for the D factor ($F(1, 163) = 2.15$, p

405 $= .144$, $\eta_p^2 = 0.013$); the differences between the U and D factors were significant under both

406 the moral judgment and moral action frames ($Fs(1, 163) \geq 1257.07$, $ps < .001$, $\eta_p^2 \geq 0.885$).

407   The results of the process dissociation procedure indicate that the moral action frame

408 activates more utilitarian propensity than does the moral judgment frame, but this activating

409 advantage was not significant for deontological propensity. However, the process dissociation

410 considered only the proscriptive norm scenarios, not the prescriptive norm scenarios, thereby

411 demonstrating similar theoretical limitations to those found for the traditional dilemma

412 paradigm. Analysis 2 used repeated ANOVAs and CAN algorithm to further clarify which of

413 consequence sensitivity, norm sensitivity and generalized action/inaction preference matters in

414 moral question-framing effect.

415 *Analysis 2: ANOVA and CAN analyses*

416   We conducted a 2 (frames: moral judgment/moral action) × 2 (norm:

417   prescriptive/proscriptive) × 2 (consequence: benefits greater than/smaller than costs) within-

418   subject ANOVA, as shown in Fig. 4.

419   <Insert Fig. 4 near here>

420   Regarding the main effects, the moral ratings under the moral judgment frame were

421   significantly higher than those under the moral action frame ($F(1, 163) = 66.72$, $p < .001$, η_p^2

422     $= 0.29$); the moral ratings under the prescriptive norm were significantly higher than those

423   under the proscriptive norm ($F(1, 163) = 680.83$, $p < .001$, $\eta_p^2 = 0.81$); and the moral ratings

424   when the benefits were greater than the costs were significantly higher than those when the

425   benefits were smaller than the costs ($F(1, 163) = 207.92$, $p < .001$, $\eta_p^2 = 0.56$).

426   The interaction between the frames and norm was significant ($F(1, 163) = 78.38$, p

427     $< .001$, $\eta_p^2 = 0.33$). Further simple effect analysis indicated that moral ratings under the moral

428   judgment frame were significantly higher than those under the moral action frame only under

429   the prescriptive norm conditions ($F(1, 163) = 107.92$, $p < .001$, $\eta_p^2 = 0.398$), but not under the

430   proscriptive norm conditions ($F(1, 163) = 0.50$, $p = .48$, $\eta_p^2 = 0.003$); the moral ratings of the

431   prescriptive norm were significantly higher than those of the proscriptive norm under both the

432   moral judgment and moral action frames (Fs$(1, 163) \geq 487.09$, ps $< .001$, $\eta_p^2 \geq 0.749$).

433   The interaction between frames and consequence was significant ($F(1, 163) = 72.47$,

434     $p < .001$, $\eta_p^2 = 0.31$). Further simple effect analysis indicated that the moral ratings under the

435   moral judgment frame were significantly higher than those under the moral action frame only

436   when the benefits were smaller than the costs ($F(1, 163) = 134.23$, $p < .001$, $\eta_p^2 = 0.452$), but

437   not when the benefits were greater than the costs ($F(1, 163) = 0.85$, $p = .357$, $\eta_p^2 = 0.005$); the

438   moral ratings when the benefits were greater than the costs were significantly higher than those

439   when the benefits were smaller than the costs under both the moral judgment and moral action

440   frames ($Fs(1, 163) \geq 105.55$, $ps < .001$, $\eta_p^2 \geq 0.393$).

441   The interaction between norm and consequence was significant ($F(1, 163) = 5.66$, p

442    $= .019$, $\eta_p^2 = 0.034$). Additionally, the simple effects of both norm and consequence were

443   significant. Moral ratings of the prescriptive norm were significantly higher than those of the

444   proscriptive norm ($Fs(1, 163) \geq 482.33$, $ps < .001$, $\eta_p^2 \geq 0.747$), and the moral ratings when the

445   benefits were greater than the costs were significantly higher than those when the benefits were

446   smaller than the costs ($Fs(1, 163) \geq 85.23$, $ps < .001$, $\eta_p^2 \geq 0.343$).

447   The triple interaction of frame, norm, and consequence was significant ($F(1, 163) =$

448   21.53, $p < .001$, $\eta_p^2 = 0.117$). The simple effects of frame were significant ($Fs(1, 163) \geq 4.74$,

449    $ps \leq .031$, $\eta_p^2 \geq 0.028$). Specifically, only in the condition of the proscriptive norm were the

450   benefits greater than the costs, and the moral rating under the moral action frame was

451   significantly higher than that under the moral judgment frame; in the other three conditions,

452   the moral ratings under the moral action frame were significantly lower than those under the

453   moral judgment frame. The simple effects of both norm and consequence were significant.

454   Moral ratings of the prescriptive norm were significantly higher than those of the proscriptive

455   norm ($Fs(1, 163) \geq 287.49$, $ps < .001$, $\eta_p^2 \geq 0.638$), and the moral ratings when the benefits

456   were greater than the costs were significantly higher than those when the benefits were smaller

457   than the costs ($Fs(1, 163) \geq 61.11$, $ps < .001$, $\eta_p^2 \geq 0.273$).

458   To identify clearly how the moral question frames affected participants' sensitivities

459   to norm/consequence and generalized action/inaction preferences, we performed two steps of

460   data transformation. First, we transformed the participants' original moral rating scores into

461   approval ratio data, with the original moral acceptance scores divided by 9. Second, we

462   calculated the indexes with the CAN algorithm.

463   We then performed a paired-sample t test to compare the norm/consequence

464   sensitivity indexes and generalized action/inaction preferences across the moral judgment and

465   moral action frames. The results show that, compared with the moral judgment frame, the moral

466   action frame weakened norm sensitivity ($M_{\text{moral action}}$ = 0.37, SD = 0.22, 95%CI [0.34, 0.41],

467    $M_{\text{moral judgment}}$ = 0.47, SD = 0.22, 95%CI [0.44, 0.51], $t(163)$ = −8.85, p < .001, Cohen's d = 0.98,

468   95%CI of the difference [− 0.12, − 0.08]), strengthened consequence sensitivity ($M_{\text{moral action}}$

469   = 0.18, SD = 0.15, 95%CI [0.15, 0.20], $M_{\text{moral judgment}}$ = 0.10, SD = 0.12, 95%CI [0.08, 0.12],

470    $t(163)$ = 8.51, p < .001, Cohen's d = 0.94, 95%CI of the difference [0.06, 0.10]), and

471   transformed preferences from a generalized action preference ($M_{\text{moral judgment}}$ = 0.53, SD = 0.08,

472   95%CI [0.51, 0.54]) to a generalized inaction preference ($M_{\text{moral action}}$ = 0.48, SD = 0.09, 95%CI

473   [0.47, 0.50]), $t(163)$ = −8.17, p < .001, Cohen's d = −1.28, 95%CI of the difference [− 0.06,

474   − 0.03].

475   **Discussion**

476   The results of Study 2 not only replicated those of Study 1 but also deepened our

477   understanding of the moral-question framing effect through process dissociation and ANOVA

478   and CAN analyses. The results showed comprehensively that compared with the moral

479   judgment frame, the moral action frame weakens sensitivity to norms, strengthens sensitivity

480   to consequences, and transforms preferences from a generalized action preference to a

481   generalized inaction preference.

482   The simple effect ANOVA showed that the moral action frame generally induced a

483   lower level of moral acceptance of the utilitarian proposal than did the moral judgment frame.

484   However, this effect existed only under the conditions of the prescriptive norm and of benefits

485   being smaller than costs, but not under the conditions of the proscriptive norm and of benefits

486   being greater than costs. This result supports the action-based model of dissonance. The

487   conditions of the proscriptive norm and of benefits being greater than costs were in accordance

488   with an individual's moral principles, either deontological or utilitarian. This ensured that they

489   would not encounter cognitive dissonance and that they would not spread their alternative

490   choices when considering moral action rather than moral judgment. Under the conditions of

491   the prescriptive norm and of benefits being smaller than costs, an individual's moral principles

492   were challenged and they encountered cognitive dissonance; thus, they adjusted their choices

493   motivationally when considering moral action rather than moral judgment.

494   It is worth noting that the discrepancies between the three methods of analyses

495   demonstrate the necessity of considering comprehensively all the combinations of norms and

496   consequences to deepen our insights regarding moral decisions. The traditional dilemma

497   paradigm considered only the condition of the proscriptive norm with benefits being greater

498   than costs, while the process dissociation approach extended to the two situations of the

499   proscriptive norm and benefits being either greater or smaller than costs. The ANOVA method

500   with CAN algorithm included the four combinations of norm and consequence and showed

501   that the moral action frame not only weakened norm sensitivity but also strengthened

502   consequence sensitivity and decreased the generalized action/inaction preference.

503   With the new CAN algorithm, two new findings from Gawronski et al. (2017) were

504   found. First, we found a moral-question framing effect on consequence sensitivity, which was

505   not found in their work. Second, participants in the study by Gawronski et al. (2017) had an

506   unstable generalized *action* preference under the moral judgment frame (according to the data

507   that they provided, the I parameter in their Study 3a was not significantly lower than 0.5, 95%

508   CI [0.44, 0.52], implying no significant generalized action preference, while it was

509   significantly lower than 0.5 in their Study 3b, 95% CI [0.41, 0.48], implying a significant

510   generalized action preference). Thus, based on their study, compared with the moral judgment

511   frame, the moral action frame may not *transform* participants' generalized *action* preference

512   into a generalized *inaction* preference. Conversely, this transformation phenomenon was very

513   significant in our study.

514   However, the algorithm validity together with the new findings needs to be assessed

515   further. In addition, the continuous rating scales used in Studies 1 and 2 may not represent

516   participants' definite yes/no attitude. Therefore, using a binary yes-or-no response in Study 3,

517   the mature and effective CNI model was used to measure independently the sensitivities to

518   norm/consequence and generalized inaction/action preference, as well as to evaluate the

519   proposed CAN algorithm and the associated findings in Study 2. Furthermore, the robustness

520   of Studies 1 and 2 was tested again.

STUDY 3

Method

Participants

In this study, 205 university students participated (101 females; aged 17 to 29, *M* = 19.90, *SD* = 1.39, one student did not report age). The participants were clearly informed about the study and signed the consent forms. They were compensated with course credit after the study was completed. The sample size was determined according to the similar Study 3a/3b by Gawronski et al. (2017). They recruited 200 participants to provide an effect size of 0.40 and a statistical power of 0.80. We recruited several more participants in case some did not pass the attitude check item. The results were not checked before terminating the data collection. Seven participants did not pass the attitude check item, and their data were excluded from further analysis. The sensitivity power analysis (G*Power; Faul et al., 2007) determined that effect sizes of *d* = 0.20 (*N* = 205) could be detected with standard criteria (i.e., *α* = 0.05 two-tailed, 1- *β* = 0.80, difference between two dependent means of matched pairs).

Design

Study 3 had the same 2 (norm: proscriptive/prescriptive) × 2 (consequence: benefits greater than/smaller than costs) × 2 (frame: moral judgment/moral action) within-subject design as that used in Study 2. The difference was that a binary reaction mode replaced the continuous rating. Participants were asked to indicate whether it was morally acceptable to perform the described action (moral judgment) and whether they would perform the described action (moral action). "Yes" or "No" options were provided for participants to indicate their

542   answers. The C, N, and I parameters under the moral judgment and moral action frames were

543   calculated according to the procedures presented by Gawronski et al. (2017). Additionally,

544   analyses 1, 2, and 3 evaluated the robustness of Studies 1 and 2 with the participants' moral

545   approval ratios, which were computed with their "yes" frequencies divided by 6 (number of

546   dilemma scenarios). If the moral approval ratio was greater (less) than 0.5, then the participants

547   were identified as being utilitarian (deontological), and the higher the ratio, the more utilitarian

548   or less deontological they were coded as being.

549   *Materials and procedure*

550   In addition to the three dilemma scenarios used in Study 2, three more dilemma

551   scenarios (Assisted Suicide, Immune Deficiency, and Abduction) were chosen from Gawronski

552   et al. (2017) (see Appendix 2). All the dilemma scenarios have a significant moral relevance in

553   the research population, as shown in the supplemental materials. The six dilemmas and their

554   four parallel versions constituted 24 sessions of scenarios. The attitude check scenario from

555   Gawronski et al. (2017) was also included in Study 3. Therefore, participants read 25 sessions

556   of scenarios presented randomly by Inquisit 3.0 and answered sequentially the moral judgment

557   and moral action framing questions after each scenario. The other procedures were the same as

558   those in Study 2.

559   **Results**

560   All the results of Studies 1 and 2 were well replicated, as shown in the supplemental

561   materials. Present analysis used the CNI model to further verify the validity of CAN algorithm

562   and its new findings.

563   We used the software and the model provided by Gawronski et al. (2017), and the

564 results were shown in Fig. 5. It should be noted that the scoring method of generalized

565 action/inaction preference was opposite in CAN algorithm and in the CNI model. Specifically,

566 in CAN algorithm, greater values of generalized action/inaction preference represented more

567 generalized *action* preference, and values were identified as indicating generalized *action*

568 (*inaction*) preference if they were significantly greater (smaller) than 0.5. Conversely, in the

569 CNI model, greater values of generalized inaction/action preference represented more

570 generalized *inaction* preference, and values were identified as indicating generalized *inaction*

571 (*action*) preference if they were significantly greater (smaller) than 0.5. The norm and

572 consequence sensitivity indexes were scored in the same direction in both methods.

573   <Insert Fig. 5 near here>

574   The CNI model did not fit the data in the current study, as the response pattern deviated

575 significantly from the default response pattern ($G^2(2) = 12.26$, $p = .002$). However, the effect

576 size was rather small (Cohen, 1988), in accordance with the results of Study 3b in the

577 Gawronski et al. (2017) paper (Cohen's $w = 0.050$), and the Bayesian information criteria were

578 negative (ΔBIC $= -6.05$), indicating that the misfit could be negligible and further analysis was

579 tenable (Moshagen, 2010). Further analysis showed that, under both the moral judgment and

580 moral action frames, participants were significantly sensitive to consequence and norm, and

581 the parameters were significantly greater than 0. For the C parameter, $M_{\text{moral judgment}} = 0.13$ (95%

582 CI [0.11, 0.16], $\Delta G^2(1) = 123.38$, $p < .001$, Cohen's $d = 0.810$) and $M_{\text{moral action}} = 0.26$ (95% CI

583 [0.23, 0.29], $\Delta G^2(1) = 368.94$, $p < .001$, Cohen's $d = 1.420$); for the N parameter, $M_{\text{moral judgment}}$

584 $= 0.60$ (95% CI [0.57, 0.63], $\Delta G^2(1) = 1415.85$, $p < .001$, Cohen's $d = 2.931$) and $M_{\text{moral action}} =$

585 0.45 (95% CI [0.41, 0.48], $\Delta G^2(1) = 578.02$, $p < .001$, Cohen's $d = 1.792$). Regarding the

586 generalized inaction/action preference, participants showed a significant generalized *action*

587 preference under the moral judgment frame, i.e., the I parameter was significantly less than 0.5

588 ($M_{\text{moral judgment}} = 0.34$, 95% CI [0.31, 0.38], $\Delta G^2(1) = 81.36$, $p < .001$, Cohen's $d = -0.667$),

589 while they had a significant generalized *inaction* preference under moral action frame, i.e., the

590 I parameter was significantly greater than 0.5 ($M_{\text{moral action}} = 0.55$, 95% CI [0.52, 0.58], $\Delta G^2(1)$

591 $= 10.30$, $p < .001$, Cohen's $d = 0.214$).

592   Paired comparisons between the moral judgment and moral action frames showed that

593 moral-question framing effects existed for all the parameters: C parameter, $\Delta G^2(1) = 49.65$, p

594 $< .001$, Cohen's $d = -0.714$; N parameter, $\Delta G^2(1) = 44.42$, $p < .001$, Cohen's $d = 0.682$; and I

595 parameter, $\Delta G^2(1) = 77.76$, $p < .001$, Cohen's $d = -0.901$). Specifically, compared with the

596 moral judgment frame, the moral action frame weakened the sensitivity to norms, strengthened

597 the sensitivity to consequences, and resulted in a transition from a generalized action preference

598 to a generalized inaction preference.

599 **Discussion**

600   Study 3 used four analysis approaches to explore the moral-question framing effect.

601 The results of Studies 1 and 2 were well replicated. The results of above analysis were

602 congruent with the results based on CAN algorithm. Taken together, compared with the moral

603 judgment frame, the moral action frame caused less sensitivity to norms, more sensitivity to

604 consequences, and resulted in a transition from a generalized action preference to a generalized

605   inaction preference. Specifically, the moral action frame induced more utilitarian, less

606   deontological propensities and more generalized inaction preferences than the moral judgment

607   frame.

608   We used four analytical approaches to assess the moral-question framing effect

609   (Table 1). The traditional dilemma paradigm and the process dissociation procedure did not

610   cover the four combinations of norm and consequence, resulting in ambiguous theoretical

611   inferences. The ANOVA with CAN algorithm and CNI model covered all four combinations

612   theoretically. The ANOVA with CAN algorithm turned out the same results from CNI model

613   analysis. It demonstrated the validity of CAN algorithm. Thus, CAN algorithm and CNI model

614   analyses could be comprehensively used in the future study and validated each other.

615   <Insert Table 1 near here>

616   Our Study 3 confirmed further the results of Study 2 and advanced the comprehension

617   of the moral-question framing effect in three important ways. First, the moral action frame

618   induced more sensitivity to consequence than did the moral judgment frame, which was not

619   found by Gawronski et al. (2017). This could be due to the differences in the cultural

620   backgrounds of the participants between the two studies. As mentioned by previous researchers,

621   Chinese people typically seek a "middle way" when dealing with contradictory issues (Peng &

622   Nisbett, 1999; Spencer-Rodgers, Williams, & Kaiping, 2010). Specifically, with respect to

623   dilemmas, Chinese people will try to balance the norm and consequence. Thus, in our study,

624   the participants endured cognitive dissonance and dissonance reduction through alternative

625   spreading in relation to both the norm and consequence aspects, further demonstrating the

626   moral-question framing effects. Alternatively, in Western cultures, individuals may focus on

627   the moral norm nature of the proposal but may not care as much about the consequence, and

628   they do not show a moral-question framing effect in consequence. This cross-cultural

629   phenomenon should be assessed in a future study.

630   Second, the moral-question framing effect on norms in the study by Gawronski et al.

631   (2017) was marginally significant in Study 3a ($\Delta G^2(1) = 3.31$, $p = .069$, $d = 0.268$) and more

632   strongly significant in Study 3b ($\Delta G^2(1) = 6.15$, $p = .013$, $d = 0.363$). However, it was quite

633   significant in the present study, based on the results from both the ANOVA with CAN algorithm

634   and the CNI model. This discrepancy could be due to the different experimental designs.

635   Gawronski et al. (2017) applied a between-subject design, whereas we used a within-subject

636   design. Our design provided greater control over random errors of individual difference,

637   making the effect more robust.

638   Third, participants transformed their generalized action into an inaction preference

639   when the situation was framed by moral action rather than by moral judgment. This

640   *transformation* phenomenon was found in our Study 2 and confirmed in Study 3 but was not

641   found by Gawronski et al. (2017). It may also be due to the cultural differences regarding

642   change. From the Chinese dialectical perspective, individuals will be more likely to change to

643   keep all sides balanced compared with their Western counterparts (Ji, Nisbett, & Su, 2001; Ji,

644   Zhang, & Guo, 2008). This stronger propensity is probably why the Chinese participants in our

645   studies were more likely to change their attitude according to the descriptive frames than were

646   Westerners. This assumption should also be tested in future studies.

647   **GENERAL DISCUSSION**

648   Three studies with four analysis approaches demonstrated comprehensively that

649   individuals will exhibit a weaker deontological propensity and stronger utilitarian propensity

650   and will exhibit a transformation from a generalized action preference to a generalized inaction

651   preference under a moral action frame compared with a moral judgment frame.

652   The results of the present study, together with those of Gawronski et al. (2017), were

653   in some ways incongruent with the prediction of the dual-process morality theory, namely that

654   the norm sensitivity should be stronger under the moral action frame than under the moral

655   judgment frame. However, the results were the opposite of this prediction. The first reason for

656   this is the theoretical concept-manipulation differences that have already been discussed by

657   Gawronski et al. (2017). The dual-process morality theory considers only the one situation of

658   the proscriptive norm alongside benefits being greater than costs, while the present Studies 2

659   and 3, as well as Gawronski's work, covered the four combinations of norm and consequence.

660   The second reason relates to the underlying process differences. The dual-process

661   model of morality mainly discusses the cognitive and emotional processes, but not the

662   motivation process. The moral action frame is associated with a stronger acting motivation than

663   that of the moral judgment frame, which could cause individuals to spread their choices.

664   Regarding the stronger sacrificial disgust emotion evoked by the moral action frame compared

665   with the moral judgment frame (Gawronski et al., 2017; Pletti et al., 2017), this may simply

666   reinforce the individual's generalized inaction preference, which could not be dissociated in

667   the previous studies. In the current study and that by Gawronski et al. (2017), participants

668   generally tended to reject the proposal under the moral action frame more often than under the

669   moral judgment frame, supporting the prediction of the dual-process morality theory. Therefore,

670   the dual-process morality theory may be applicable for explaining individuals' generalized

671   action/inaction preference but inapplicable for explaining the norm/consequence sensitivity.

672   The results supported the action-based model of dissonance, which focuses on the

673   cognitive dissonance state in decisions. Individuals tend to exhibit more alternative-spreading

674   behavior after being in a state of high cognitive dissonance (Harmon-Jones, 1999; Harmon-

675   Jones & Harmon-Jones, 2002; Harmon-Jones et al., 2009; Harmon-Jones et al., 2015). In

676   Harmon-Jones's research, individuals with higher approach motivation exhibited more

677   cognitive-dissonance reduction behavior and evaluated more thoroughly the alternative choices

678   (Harmon-Jones & Harmon-Jones, 2002). In the present study, the simple effect of the moral

679   question frames existed neither when benefits were greater than costs nor when there was a

680   proscriptive norm. These two situations were in accordance with people's moral principles,

681   namely obeying the rules (mainly, proscriptive rules) to gain the greatest benefits. Therefore,

682   they did not endure significant cognitive dissonance and would not change their choices under

683   the moral action frame more than they would under the moral judgment frame. Both when

684   benefits were smaller than costs and when there was a prescriptive norm, individuals would

685   endure significant cognitive dissonance and spread their choices to alternatives for dissonance

686   reduction, resulting in the moral-question framing effects.

687 **Contributions**

688   The present research is inspired by but does not simply replicate that of Gawronski et

689 al. (2017). It offers four main contributions toward knowledge advancement. First, we provided

690 a motivation process perspective on moral decision-making. The mainstream moral theory of

691 dual process focuses on the competitive processes of cognition and emotion. It provides a

692 strong explanation with respect to moral judgment but not when considering moral action. The

693 present research, together with that of Gawronski et al. (2017), draws our attention to the

694 motivation process when considering moral actions. Individuals enduring dissonance with their

695 default moral principles will adjust their choices when considering moral action compared with

696 moral judgment. This tendency can be explained by the action-based model of dissonance

697 (Harmon-Jones & Harmon-Jones, 2002; Harmon-Jones et al., 2009; Harmon-Jones et al., 2015),

698 implying that individuals are pursuing a balance between norm and consequence. Therefore,

699 the action-based model of cognitive dissonance may be used to explain the motivation process

700 of a moral decision, complementing the dual-process model's explanation of cognition and

701 emotion. The dual-process morality theory could be used to explain the general action/inaction

702 preference discrepancy between moral action and moral judgment frames, while the action-

703 based model of cognitive dissonance could explain all the index changes of norm/consequence

704 sensitivity and generalized action/inaction preferences between the two frames.

705   Second, the simple effects of the moral question frames existed only when the benefits

706 were smaller than the costs and when there was a prescriptive norm, but not when benefits were

707 greater than costs or when there was a proscriptive norm, as shown by the ANOVA results in

708   Studies 2 and 3. To the best of our knowledge, this phenomenon has not been identified

709   previously, and it supports further the action-based model of dissonance. Both when benefits

710   were greater than costs and when there was a proscriptive norm, individuals did not endure

711   significant cognitive dissonance and did not exhibit significant moral-question framing effects.

712   In the subconscious, norms are for obeying and greater benefits are for pursuing. This ties in

713   with an individual's default moral principles. Otherwise, individuals will endure cognitive

714   dissonance and spread their choices when considering moral action relative to moral judgment.

715   Third, the differences between the present research and that of Gawronski et al. (2017)

716   provide new evidence for cross-cultural differences in moral decision-making. Specifically,

717   Studies 2 and 3 implied that sensitivity to norms, consequences, and generalized

718   inaction/action preferences were all affected by the moral question frames in the Chinese

719   participants, while for the Western participants in the study by Gawronski et al. (2017), the

720   sensitivity to consequence was not affected by the moral question frames. This discrepancy

721   may be explained through differences in dialectical thinking (Peng & Nisbett, 1999; Spencer-

722   Rodgers et al., 2010) and different attitudes to change (Ji et al., 2001; Ji et al., 2008). Chinese

723   people tend to pursue a "middle way" and seek a balance between norm and consequence,

724   while Westerners may care more about the moral norm nature of the proposal. Consequently,

725   in the present study, the Chinese participants showed moral-question framing effects with

726   respect to both consequences and norms, while the Western participants showed that effect only

727   in relation to norms. Regarding the generalized inaction/action preferences, the Chinese

728   participants showed an obvious transformation while the Westerners did not.

729   Fourth, the present research comprehensively applied four main analysis approaches;

730   in particular, the ANOVA with CAN algorithm to calculate the norm/consequence indexes and

731   generalized action/inaction preference complemented previous methodologies (Liu, & Liao, in

732   review). The ANOVA with CAN algorithm covered the four combinations of norm and

733   consequence and can be further used for correlation and regression analysis. This advantage

734   over the CNI model should be considered in future studies. Therefore, ANOVA and the CNI

735   model should be comprehensively used as necessary. Furthermore, Hütter and Klauer (2016)

736   proposed that the model based on a multinomial processing tree should be applied only in a

737   within-subject design. This insight was utilized to develop the present research methodology

738   and the moral question frames were also within subject designed. This may explain why we

739   obtained a more robust effect than Gawronski et al. (2017). Other studies with the same

740   theoretical structure, such as exploring how harming intention and harming consequence affect

741   moral blame responsibility, could also refer to the present study's approach, whereby a 2

742   (harming intention: yes/no) × 2 (harming consequence: yes/no) design could be applied.

743   **Possible Critiques**

744   Critics of our work may argue that there are three possible limitations. First, more

745   ecological-dilemma scenarios must be developed because the hypothesized situations may

746   differ from those in real life. We want to emphasize that the real problem is whether the

747   scenarios are truly relevant to the study population's morality. For this reason, we conducted

748   the pilot study to guarantee the morality relevance of the scenarios. Based on the pilot study,

749   the most morality-relevant scenarios were adopted. Furthermore, familiarity with the scenarios

750 could be a noise variable if we selected the scenarios from real life instead of fictitious scenarios.

751 Therefore, we did consider this possible limitation before beginning the study and developed

752 the "air pollution" and "jump the queue" dilemma scenarios based on everyday life experience.

753 The other dilemmas were obtained from previous studies; they were life-or-death-related

754 stories, which may not have been very familiar to the participants. The results were stable and

755 reliable across these dilemmas.

756 Second, a fixed random order for presenting scenarios may be needed to reduce the

757 random error. In Study 3, the model fit for the CNI model failed, although the effect size was

758 small enough to be negligible. Probably because we used a random order to present the scenario,

759 the sequence of scenarios for each participant was different and resulted in more random errors.

760 Therefore, we do recommend that a fixed random order may be needed to reduce the random

761 error, as presented in Gawronski et al. (2017). However, we still want to note that the results

762 were stable and well replicated across the three studies. Therefore, the presenting order of the

763 scenarios may have potential interference but was negligible.

764 Finally, but most importantly, critics may argue that the framing questions were

765 answered sequentially (moral judgment framing question first and moral action framing

766 question second), this sequential order but not the internal approach motivation induced the

767 moral-question framing effect. Participants may generally adjust their answers subsequently

768 regardless of which question was asked. However, we do not think this sequential answering

769 order matters much. Especially in the simple effect analyses of Studies 2 and 3, the question

770 framing effects did not appear when there were proscriptive norms and when benefits were

771   greater than costs, but they appeared when there were prescriptive norms and when benefits

772   were less than costs. This result means that the participants were not randomly adjusting their

773   answers but were adjusting them based on whether the situations contradicted their moral

774   principles. Let us assume that participants were anchored when answering the first question

775   and adjusted their answers when presented with the second question regardless of whether the

776   question was framed by moral judgment or moral action. If this is true, the response patterns

777   should be the same across all the scenarios. However, the response patterns in Studies 2 and 3

778   were not the same across the four editions of scenarios that combined norms and consequences.

779   Therefore, the response order of the questions did not interfere significantly with the results,

780   and future studies could also apply a fixed random order to verify this result further.

781   **CONCLUSION**

782   Three studies with four analysis approaches demonstrated that a moral action frame

783   activates weaker deontological propensity and stronger utilitarian propensity, as well as causes

784   a transition from a generalized action preference to an inaction preference, compared with a

785   moral judgment frame. The results support the action-based model of cognitive dissonance and

786   add to the moral theory regarding the motivation process on moral decisions.

787   **Appendix 1: The Scenarios Used in Study 1**

788   **Scenario 1: Crying Baby; Mean emotion rating: 6.8; High-conflict**

789   Enemy soldiers have taken over your village. They have orders to kill all remaining

790   civilians. You and some of your townspeople have sought refuge in the cellar of a large house.

791   Outside you hear the voices of soldiers who have come to search the house for valuables.

792   Your baby begins to cry loudly. You cover his mouth to block the sound. If you remove

793   your hand from his mouth his crying will summon the attention of the soldiers who will kill

794   you, your child, and the others hiding out in the cellar. To save yourself and the others you must

795   smother your child to death.

796   Would you smother your child in order to save yourself and the other townspeople?

797   **Scenario 2: Ecologists; Mean emotion rating: 6.1; High-conflict**

798   You are part of a group of ecologists who live in a remote stretch of jungle. The entire

799   group, which includes eight children, has been taken hostage by a group of paramilitary

800   terrorists. One of the terrorists takes a liking to you. He informs you that his leader intends to

801   kill you and the rest of the hostages the following morning.

802   He is willing to help you and the children escape, but as an act of good faith he wants

803   you to kill one of your fellow hostages whom he does not like. If you refuse his offer all the

804   hostages including the children and yourself will die. If you accept his offer then the others will

805   die in the morning but you and the eight children will escape.

806   Would you kill one of your fellow hostages in order to escape from the terrorists and

807   save the lives of the eight children?

808   **Scenario 3: Sacrifice; Mean emotion rating: 6.7; High-conflict**

809   You, your husband, and your four children are crossing a mountain range on your return

810   journey to your homeland. You have inadvertently set up camp on a local clan's sacred burial

811   ground.

812   The leader of the clan says that according to the local laws, you and your family must

813   be put to death. However, he will let you, your husband, and your three other children live if

814   you you will kill your oldest son.

815   Would you kill your oldest son in order to save your husband and your other three

816   children?

817   **Scenario 4: Footbridge; Mean emotion rating: 6.0; High-conflict**

818   A runaway trolley is heading down the tracks toward five workmen who will be killed

819   if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between

820   the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who

821   happens to be very large.

822   The only way to save the lives of the five workmen is to push this stranger off the bridge

823   and onto the tracks below where his large body will stop the trolley. The stranger will die if

824   you do this, but the five workmen will be saved.

825   Would you push the stranger onto the tracks in order to save the five workmen?

826   **Scenario 5: Sophie's Choice; Mean emotion rating: 6.6; High-conflict**

827   It is wartime and you and your two children, ages eight and five, are living in a territory

828   that has been occupied by the enemy. At the enemy's headquarters is a doctor who performs

829   painful experiments on humans that inevitably lead to death.

830   He intends to perform experiments on one of your children, but he will allow you to

831   choose which of your children will be experimented upon. You have twenty-four hours to bring

832   one of your children to his laboratory. If you refuse to bring one of your children to his

833   laboratory, he will find them both and experiment on both of them.

834   Would you bring one of your children to the laboratory in order to avoid having them

835   both die?

836   **Scenario 6: Vitamins; Mean emotion rating: 5.8; High-conflict**

837   You are the leader of a mountaineering expedition that is stranded in the wilderness.

838   Your expedition includes a family of six that has a genetically caused vitamin deficiency. A few

839   people's kidneys contain large amounts of this vitamin.

840   There is one such person in your party. The only way to save the lives of the six

841   members of this family is to remove one of this man's kidneys so that the necessary vitamins

842   may be extracted from it. The man will not die if you do this, but his health will be compromised.

843   The man is opposed to this plan, but you have the power to do as you see fit.

844   Would you forcibly remove this man's kidney in order to save the lives of the six

845   vitamin-deficient people?

846

847 **Appendix 2: Dilemma Scenarios Used in Studies 2 And 3.**

848 The former two dilemmas are self-compiled and the later four dilemmas are selected from Gawronski et al.

849 (2017). The former three dilemmas were used in Study 2 and all of the dilemmas were used in Study 3.

Dilemmas	Proscriptive norm prohibits action		Prescriptive norm prescribes action	
	Benefits of action greater than costs	**Benefits of action smaller than costs**	**Benefits of action greater than costs**	**Benefits of action smaller than costs**
Air Pollution	You are the director of the village enterprise management committee. One village enterprise is located between villages A and B. The exhaust gases blow toward village B. If no purification equipment is installed, the air quality will be affected, causing one additional cold each year for the villagers in village B, while each villager in village A will get an extra 50,000 enterprise bonus every year, rapidly addressing the issue of poverty. *Is it acceptable in this case not to install purification equipment?*	You are the director of the village enterprise management committee. One village enterprise is located between villages A and B. The exhaust gases blow toward village B. If no purification equipment is installed, the air quality will be affected, causing an average lifespan decrease of 5 years for villagers in village B, while each villager in village A will get an extra 1,000 enterprise bonus every year and an improved quality of life. *Is it acceptable in this case not to install purification equipment?*	You are the director of the village enterprise management committee. One village enterprise is located between villages A and B. The exhaust gases blow toward village B. If purification equipment is installed, the air quality will not be affected, causing an average lifespan increase of 5 years for villagers in village B, while each villager in village A will get 1,000 less of an enterprise bonus every year and a small reduction in quality of life. *Is it acceptable in this case to install purification equipment?*	You are the director of the village enterprise management committee. One village enterprise is located between villages A and B. The exhaust gases blow toward village B. If purification equipment is installed, the air quality will be affected, causing one less cold each year for the villagers in village B, while each villager in village A will get 50,000 less of an enterprise bonus every year and continue to struggle in poverty. *Is it acceptable in this case to install purification equipment?*
Jump the Queue	You are an ordinary passenger. In the ticket hall of the	You are an ordinary passenger. In the ticket hall of the	You are an ordinary passenger. In the ticket hall of the	You are an ordinary passenger. In the ticket hall of the

	railway station, a person needs to buy tickets for a train that is about to depart. If you help him to jump the queue and buy the tickets for the only train on the same day, his group of five can successfully travel, but it will affect the travel of one other person. *Is it acceptable in this case to help him jump the queue?*	railway station, a person needs to buy tickets for a train that is about to depart. If you help him to jump the queue, he himself can successfully travel, but it will affect the travel of another five people who wish to buy tickets for the only train on the same day. *Is it acceptable in this case to help him jump the queue?*	railway station, a person is jumping the queue to buy a ticket for a train that is about to depart. If you stop him from jumping the queue, he cannot travel successfully, but it will guarantee that another five people can buy tickets for the only train on the same day. *Is it acceptable in this case to stop him from jumping the queue?*	railway station, a person needs to buy a ticket for a train that is about to depart. If you stop him from jumping the queue, he cannot successfully travel, and the disturbance caused by your behavior will affect the travel of another five people who wish to buy tickets for the only train on the same day. *Is it acceptable in this case to stop him from jumping the queue?*
Transplant	You are a surgeon in a small hospital. One day, your hospital receives five badly hurt patients from a car accident. The patients all need organ transplants or they will die. You have no spare organs, but there is a patient who has been in a coma for several weeks and it seems unlikely that he will wake up again. You could terminate his life support and take his organs for the five	You are a surgeon in a small hospital. One day, your hospital receives five badly hurt patients from a car accident. These patients all need organ transplants or they will have serious health problems for the rest of their lives. You have no spare organs, but there is a patient who has been in a coma for several weeks and it seems unlikely that he will wake up again. You could	You are a surgeon in a small hospital. One day, your hospital receives five badly hurt patients from a car accident. These patients all need organ transplants or they will have serious health problems for the rest of their lives. You have no spare organs, but there is a patient who has been in a coma for several weeks and it seems unlikely that he will wake up again. One of your	You are a surgeon in a small hospital. One day, your hospital receives five badly hurt patients from a car accident. The patients all need organ transplants or they will die. You have no spare organs, but there is a patient who has been in a coma for several weeks and it seems unlikely that he will wake up again. One of your co-workers plans to terminate his life support and take his

accident victims, so that their lives will be saved. *Is it acceptable in this case to terminate the patient's life support to take his organs?*	terminate his life support and take his organs for the five accident victims, so that they won't suffer from health problems. *Is it acceptable in this case to terminate the patient's life support to take his organs?*	co-workers plans to terminate his life support and take his organs for the five accident victims, so that they won't suffer from health problems. You could stop your co-worker by informing the director of the hospital. *Is it acceptable in this case to stop your co-worker from terminating the patient's life support to take his organs?*	organs for the five accident victims, so that their lives will be saved. You could stop your co-worker by informing the director of the hospital. *Is it acceptable in this case to stop your co-worker from terminating the patient's life support to take his organs?*
Assisted Suicide	You are a doctor and are treating a seriously ill, suffering patient. Even the strongest drugs do not relieve him from his pain anymore. He feels terrible agony and you know that his condition will never improve. For days, he has been waiting for his death. Since he no longer wants to endure his pain, he repeatedly asks you to end his life. You could give him a drug causing his death, which will	You are a doctor and are treating a seriously ill, suffering patient. Even the strongest drugs do not relieve him from his pain anymore. He feels terrible agony, but you know that he will get better again soon. For days, he has been waiting to see improvements. Since he no longer wants to endure his pain, he repeatedly asks you to end his life. You could give him a drug causing his death, which	You are a doctor and are treating a seriously ill, suffering patient. Even the strongest drugs do not relieve him from his pain anymore. He feels terrible agony, but you know that he will get better again soon. For days, he has been waiting to see improvements. Since he no longer wants to endure his pain, he repeatedly asks you to end his life. Suddenly, he has a severe heart attack. You could give him a drug to	You are a doctor and are treating a seriously ill, suffering patient. Even the strongest drugs do not relieve him from his pain anymore. He feels terrible agony and you know that his condition will never improve. For days, he has been waiting for his death. Since he no longer wants to endure his pain, he repeatedly asks you to end his life. Suddenly, he has a severe heart attack. You could give him

	release him from his pain. *Is it acceptable in this case to provide your patient with this drug?*	will release him from his pain. *Is it acceptable in this case to provide your patient with this drug?*	save him from dying. *Is it acceptable in this case to provide your patient with this drug?*	a drug to save him from dying. *Is it acceptable in this case to provide your patient with this drug?*
Immune Deficiency	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and deadly to seniors and children. The only medication that can effectively stop the virus from spreading has severe side-effects. Although the virus will not kill her, the student suffers from a chronic immune deficiency that will make her die from these side-effects. *Is it acceptable in this case to give the student the medication?*	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and can cause severe stomach cramps. The only medication that can effectively stop the virus from spreading has severe side-effects. Although the virus will not kill her, the student suffers from a chronic immune deficiency that will make her die from these side-effects. *Is it acceptable in this case to give the student the medication?*	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and can cause severe stomach cramps. The student suffers from a chronic immune deficiency that will make her die from the virus if she is not returned to her home country for special treatment. However, taking her out of quarantine involves a considerable risk that the virus will spread. *Is it acceptable in this case to take the student out of quarantine to return her to her home country for treatment?*	You are the director of a hospital in a developing country. A foreign student who is volunteering in the country got infected with a rare virus. The virus is highly contagious and deadly to seniors and children. The student suffers from a chronic immune deficiency that will make her die from the virus if she is not returned to her home country for special treatment. However, taking her out of quarantine involves a considerable risk that the virus will spread. *Is it acceptable in this case to take the student out of quarantine to return her to her home country for treatment?*
Abduction	You are the president of your country. A guerilla	You are the president of your country. A guerilla	You are the president of your country. A guerilla	You are the president of your country. A guerilla

group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy weapons for their guerilla war, which will cause the deaths of many people. Congress has approved payment of the ransom, but you have the power to veto the payment. *Is it acceptable in this case to veto the ransom payment?*

group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy food for their families, who live in an area that has been plagued by several draughts. Congress has approved payment of the ransom, but you have the power to veto the payment. *Is it acceptable in this case to veto the ransom payment?*

group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy food for their families, who live in an area that has been plagued by several draughts. As the president, you have the power to approve payment of the ransom. *Is it acceptable in this case to approve the ransom payment?*

group operating in a conflict zone has abducted a journalist from your country and threatens to behead him if your government does not pay a ransom of one million dollars. The group will use the ransom money to buy weapons for their guerilla war, which will cause the deaths of many people. As the president, you have the power to approve payment of the ransom. *Is it acceptable in this case to approve the ransom payment?*

850

851 References

852 Barkan, R., Ayal, S., & Ariely, D. (2015). Ethical dissonance, justifications, and moral behavior.

853 *Current Opinion in Psychology, 6*, 157-161.

854 Baron, J. (1992). The effect of normative beliefs on anticipated emotions. *Journal of*

855 *Personality and Social Psychology, 63*(2), 320-330.

856 Białek, M., Paruzel-Czachura, M., & Gawronski, B. (2019). Foreign language effects on moral

857 dilemma judgments: An analysis using the CNI model. *Journal of Experimental Social*

858 *Psychology, 85*, 103855.

859 Bohm, R., & Theelen, M. M. P. (2016). Outcome valence and externality valence framing in

860 public good dilemmas. *Journal of Economic Psychology, 54*, 151-163.

861 Broeders, R., van den Bos, K., Muller, P. A., & Ham, J. (2011). Should I save or should I not

862 kill? How people solve moral dilemmas depends on which rule is most accessible.

863 *Journal of Experimental Social Psychology, 47*(5), 923-934.

864 Cao, F., Zhang, J., Song, L., Wang, S., Miao, D., & Peng, J. (2017). Framing Effect in the

865 Trolley Problem and Footbridge Dilemma. *Psychological Reports, 120*(1), 88-101.

866 Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition.). Hillsdale,

867 NJ: Erlbaum.

868 Conway, P., & Gawronski, B. (2013). Deontological and utilitarian inclinations in moral

869 decision making: a process dissociation approach. *Journal of Personality and Social*

870 *Psychology, 104*(2), 216-235.

871 Cushman, F., Young, L., & Greene, J. D. (2010). Multi-system moral psychology. In J. D. e. al.

872   (Ed.), *The Moral Psychology Handbook* (pp. 47-71). New York: Oxford University

873   Press.

874 De Dreu, C. K. W., & McCusker, C. (1997). Gain–loss frames and cooperation in two-person

875   social dilemmas: A transformational analysis. *Journal of Personality and Social*

876   *Psychology, 72*(5), 1093-1106.

877 de Heus, P., Hoogervorst, N., & Dijk, E. v. (2010). Framing prisoners and chickens: Valence

878   effects in the prisoner's dilemma and the chicken game. *Journal of Experimental Social*

879   *Psychology, 46*(5), 736-742.

880 Demaree-Cotton, J. (2014). Do framing effects make moral intuitions unreliable?

881   *Philosophical Psychology, 29*(1), 1-22.

882 Diederich, A., & Trueblood, J. S. (2018). A dynamic dual process model of risky decision

883   making. *Psychological Review, 125*(2), 270-292.

884 Evans, A. M., & van Beest, I. (2017). Gain-loss framing effects in dilemmas of trust and

885   reciprocity. *Journal of Experimental Social Psychology, 73*, 151-163.

886 Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. G. (2007). G*Power 3: A flexible statistical

887   power analysis program for the social, behavioral, and biomedical sciences. *Behavior*

888   *Research Methods, 39*(2), 175-191.

889 Gawronski, B., Armstrong, J., Conway, P., Friesdorf, R., & Hutter, M. (2017). Consequences,

890   norms, and generalized inaction in moral dilemmas: The CNI model of moral decision-

891   making. *Journal of Personality and Social Psychology, 113*(3), 343-376.

892 Gawronski, B., & Beer, J. S. (2017). What makes moral dilemma judgments "utilitarian" or

893   "deontological"? *Social Neuroscience, 12*(6), 626-632.

894   Gawronski, B., Conway, P., Armstrong, J., Friesdorf, R., & Hutter, M. (2018). Effects of

895   incidental emotions on moral dilemma judgments: An analysis using the CNI model.

896   *Emotion, 18*(7), 989-1008.

897   Greene, J. D. (2007). Why are VMPFC patients more utilitarian? A dual-process theory of

898   moral judgment explains. *Trends in Cognitive Science, 11*(8), 322-323; author reply

899   323-324.

900   Greene, J. D. (2009). Dual-process morality and the personal/impersonal distinction: A reply

901   to McGuire, Langdon, Coltheart, and Mackenzie. *Journal of Experimental Social*

902   *Psychology, 45*(3), 581-584.

903   Greene, J. D., Cushman, F. A., Stewart, L. E., Lowenberg, K., Nystrom, L. E., & Cohen, J. D.

904   (2009). Pushing moral buttons: the interaction between personal force and intention in

905   moral judgment. *Cognition, 111*(3), 364-371.

906   Greene, J. D., Morelli, S. A., Lowenberg, K., Nystrom, L. E., & Cohen, J. D. (2008). Cognitive

907   load selectively interferes with utilitarian moral judgment. *Cognition, 107*(3), 1144-

908   1154.

909   Greene, J. D., & Paxton, J. M. (2009). Patterns of neural activity associated with honest and

910   dishonest moral decisions. *Proceedings of the National Academy of Sciences of the*

911   *United States of America, 106*(30), 12506-12511.

912   Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An

913   fMRI investigation of emotional engagement in moral judgment. *Science, 293*(5537),

914   2105-2108.

915   Guo, L., Trueblood, J. S., & Diederich, A. (2017). Thinking Fast Increases Framing Effects in

916   Risky Decision Making. *Psychological Science, 28*(4), 530-543.

917   Harmon-Jones, E. (1999). Toward an understanding of the motivation underlying dissonance

918   effects: Is the production of aversive consequences necessary? In E. Harmon-Jones &

919   J. Mills (Eds.), *Cognitive dissonance: Progress on a pivotal theory in social psychology*

920   (pp. 71-99). Washington, DC, US: American Psychological Association.

921   Harmon-Jones, E., & Harmon-Jones, C. (2002). Testing the action-based model of cognitive

922   dissonance: The effect of action orientation on postdecisional attitudes. *Personality and*

923   *Social Psychology Bulletin, 28*(6), 711-723.

924   Harmon-Jones, E., Harmon-Jones, C., & Levy, N. (2015). An Action-Based Model of

925   Cognitive-Dissonance Processes. *Current Directions in Psychological Science, 24*(3),

926   184-189.

927   Harmon-Jones, E., Amodio, D. M., & Harmon-Jones, C. (2009). Action‐Based Model of

928   Dissonance. *Advances in Experimental Social Psychology, 41*, 119-166.

929   Hennig, M., & Hütter, M. (2019). Revisiting the Divide between Deontology and Utilitarianism

930   in Moral Dilemma Judgment: A Multinomial Modeling Approach. *Journal of*

931   *Personality and Social Psychology*. Advance online. DOI:10.1037/pspa0000173

932   Hutter, M., & Klauer, K. C. (2016). Applying processing trees in social psychology. *European*

933   *Review of Social Psychology, 27*(1), 116-159.

934   Ji, L. J., Nisbett, R. E., & Su, Y. (2001). Culture, change, and prediction. *Psychological Science,*

935   *12*(6), 450-456.

936   Ji, L. J., Zhang, Z. Y., & Guo, T. Y. (2008). To Buy or to Sell: Cultural Differences in Stock

937   Market Decisions Based on Price Trends. *Journal of Behavioral Decision Making,*

938   *21*(4), 399-413.

939   Koenigs, M., Young, L., Adolphs, R., Tranel, D., Cushman, F., Hauser, M., & Damasio, A.

940   (2007). Damage to the prefrontal cortex increases utilitarian moral judgements. *Nature,*

941   *446*(7138), 908-911.

942   Ledgerwood, A., & Boydstun, A. E. (2014). Sticky prospects: loss frames are cognitively

943   stickier than gain frames. *Journal of Experimental Psychology: General, 143*(1), 376-

944   385.

945   Liu, C., & Liao, J. (in review). Four Empirical Approaches for Dilemma Research and the

946   Theorotical Implications. *Psychological Methods*.

947   Macoveanu, J., Ramsoy, T. Z., Skov, M., Siebner, H. R., & Fosgaard, T. R. (2016). The Neural

948   Bases of Framing Effects in Social Dilemmas. *Journal of Neuroscience Psychology and*

949   *Economics, 9*(1), 14-28.

950   Moshagen, M. (2010). multiTree: a computer program for the analysis of multinomial

951   processing tree models. *Behavior Research Methods, 42*(1), 42-54.

952   Pastotter, B., Gleixner, S., Neuhauser, T., & Bauml, K.-H. T. (2013). To Push or Not to Push?

953   Affective Influences on Moral Judgment Depend on Decision Frame. *Cognition, 126*(3),

954   373-377.

955   Patil, I., Cogoni, C., Zangrando, N., Chittaro, L., & Silani, G. (2014). Affective basis of

956   judgment-behavior discrepancy in virtual experiences of moral dilemmas. *Social*

957   *Neuroscience, 9*(1), 94-107.

958   Peng, K. P., & Nisbett, R. E. (1999). Culture, dialectics, and reasoning about contradiction.

959   *American Psychologist, 54*(9), 741-754.

960   Petrinovich, L., & ONeill, P. (1996). Influence of wording and framing effects on moral

961   intuitions. *Ethology and Sociobiology, 17*(3), 145-171.

962   Pletti, C., Lotto, L., Buodo, G., & Sarlo, M. (2017). It's immoral, but I'd do it! Psychopathy

963   traits affect decision-making in sacrificial dilemmas and in everyday moral situations.

964   *British Journal of Psychology, 108*(2), 351-368.

965   Proulx, T., Inzlicht, M., & Harmon-Jones, E. (2012). Understanding all inconsistency

966   compensation as a palliative response to violated expectations. *Trends in Cognitive*

967   *Sciences, 16*(5), 285-291.

968   Rand, D. G., Greene, J. D., & Nowak, M. A. (2012). Spontaneous giving and calculated greed.

969   *Nature, 489*(7416), 427-430.

970   Spencer-Rodgers, J., Williams, M. J., & Kaiping, P. (2010). Cultural differences in expectations

971   of change and tolerance for contradiction: a decade of empirical research. *Personality*

972   *and Social Psychology Review, 14*(3), 296-312.

973   Talhelm, T., Zhang, X., Oishi, S., Shimin, C., Duan, D., Lan, X., & Kitayama, S. (2014). Large-

974   Scale Psychological Differences Within China Explained by Rice Versus Wheat

975   Agriculture. *Science, 344*(6184), 603-608.

976   Tassy, S., Oullier, O., Mancini, J., & Wicker, B. (2013). Discrepancies between Judgment and

977   Choice of Action in Moral Dilemmas. *Frontiers in Psychology, 4*: 250.

978   Wagemans, F. M. A., Brandt, M. J., & Zeelenberg, M. (2018). Disgust sensitivity is primarily

979   associated with purity-based moral judgments. *Emotion, 18*(2), 277-289.

980   Zhang, L., Kong, M., Li, Z., Zhao, X., & Gao, L. (2018). Chronic Stress and Moral Decision-

981   Making: An Exploration With the CNI Model. *Frontiers in Psychology, 9*: 1702.

982

983 **TABLES, TABLE CAPTIONS**

984 **TABLE 1.** Four main analysis methods in moral decision-making and the respective scenario types

985 involved.

Methodology	Proscriptive Norm		Prescriptive Norm	
	Benefits greater than costs	Benefits smaller than costs	Benefits greater than costs	Benefits smaller than costs
Traditional	+			
Process dissociation	+	+		
ANOVA with CAN algorithm	+	+	+	+
CNI	+	+	+	+

986 *Note:* + means that type of scenario was considered.

987

988

989 **FIGURES, FIGURE CAPTIONS**

990
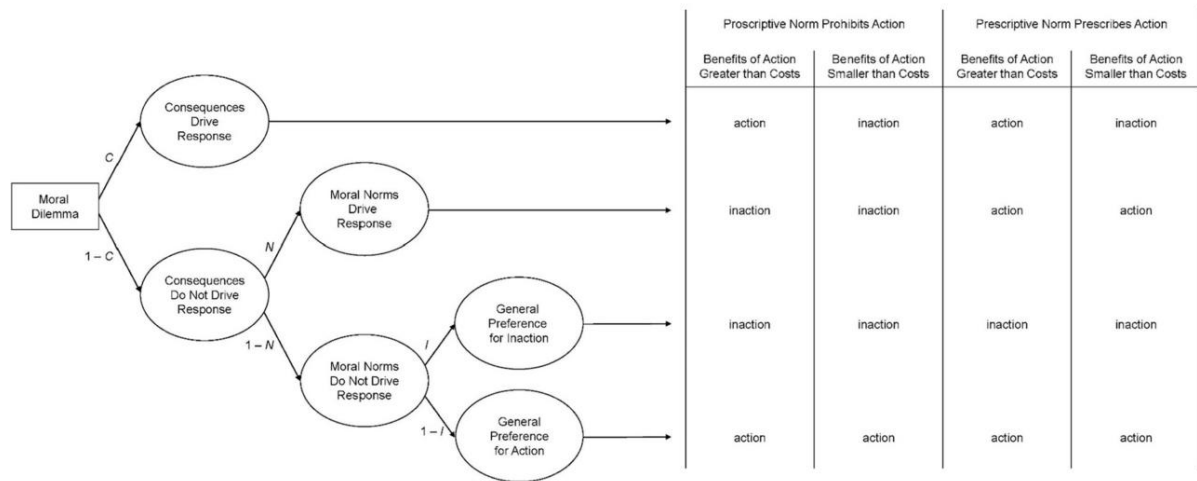
991 p (inaction | proscriptive norm, benefits > costs) = $[(1 - C) \times N] + [(1 - C) \times (1 - N) \times I]$

992 p (inaction | proscriptive norm, benefits < costs) = $C + [(1 - C) \times N] + [(1 - C) \times (1 - N) \times I]$

993 p (inaction | prescriptive norm, benefits > costs) = $(1 - C) \times (1 - N) \times I$

994 p (inaction | prescriptive norm, benefits < costs) = $C + [(1 - C) \times (1 - N) \times I]$

995 p (action | proscriptive norm, benefits > costs) = $C + [(1 - C) \times (1 - N) \times (1 - I)]$

996 p (action | proscriptive norm, benefits < costs) = $(1 - C) \times (1 - N) \times (1 - I)$

997 p (action | prescriptive norm, benefits > costs) = $C + [(1 - C) \times N] + [(1 - C) \times (1 - N) \times (1 - I)]$

998 p (action | prescriptive norm, benefits < costs) = $[(1 - C) \times N] + [(1 - C) \times (1 - N) \times (1 - I)]$

999 **FIG. 1.** CNI model of moral decision-making predicting action versus inaction responses in moral dilemmas

1000 with proscriptive and prescriptive norms and consequences involving benefits of action that are either greater

1001 or smaller than costs of action (Gawronski et al., 2017).

1002
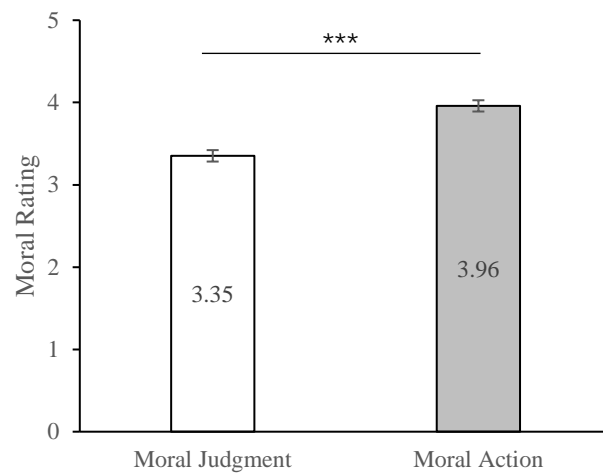
1003

1004 **FIG. 2.** Moral ratings under the moral judgment and moral action frames in Study 1.

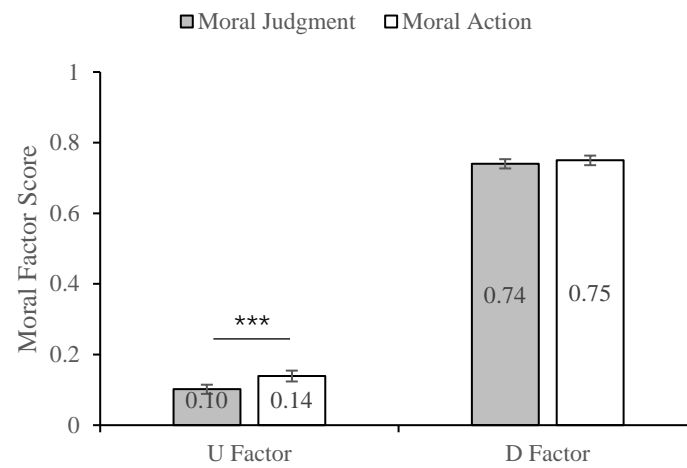1005 *Note:* Error bars represent standard errors.

1006 *** *p* < .001

1007

1008

1009

1010 **FIG. 3.** U and D factor scores under the moral judgment and moral action frames in Study 2. Only the

1011 scenarios of proscriptive norms were considered.

1012 *Note:* Error bars represent standard errors.

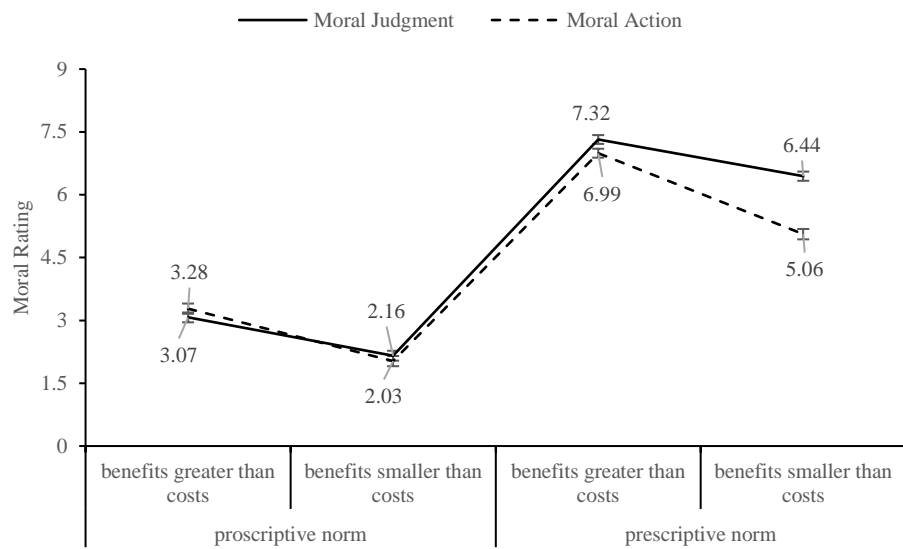1013 *** *p* < .001

1014

1015

FIG. 4. Moral ratings in the four combined situations of norm (proscriptive/prescriptive) and consequence

(benefits greater/smaller than costs) under the moral judgment and moral action frames in Study 2.
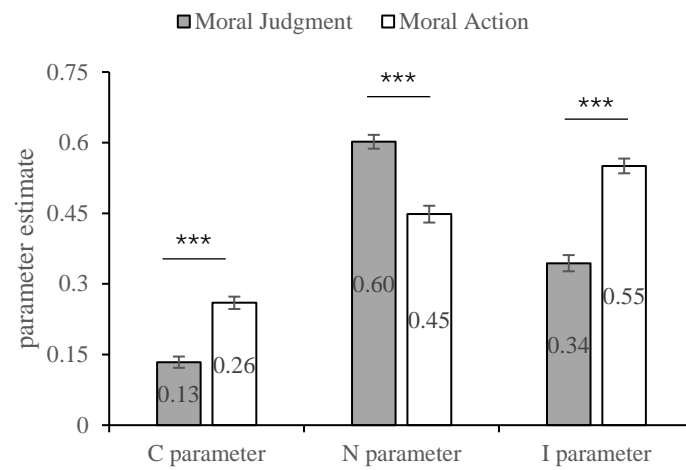
Note: Error bars represent standard errors.

1019

1020

1021

1022 **FIG. 5.** Parameter estimates of sensitivity to consequences (*C*), sensitivity to norms (*N*), and general

1023 preference for inaction versus action (*I*) as a function of question framing (moral judgment vs. moral

1024 action) in Study 3.

1025 *Note:* Error bars represent standard errors.